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NOTES ON CERTAIN MALES OF NORTH AMERICAN HORSEFLIES (TABANIDAE). II THE AFFINIS OR "RED-SIDED" GROUP OF TABANUS SENS. LAT., WITH A KEY TO THE FEMALES.

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(continued from page 40)

T. melanorhinus Big. I have a specimen from north-eastern Oregon which I suspect is the male of this species although the red on the sides of the abdomen is much more extensive than I have observed in any female (see Philip, 1936) involving the first four tergites and most of the venter, the rows of pale spots only suggested as a pale pollinosity in this sex.

Length, 14 mm. Eyes pilose, the upper facets slightly enlarged. Vertical tubercle shiny brown, small and considerably raised above the upper eye level. Frontal triangle swollen, dark brown, completely denuded, shining. Antennae rather slender, first 2 segments and extreme base of the third red, infuscated sharply from behind the dorsal angulation to the tip, distinctly angulated and gently excavated; third segment 0.35×1.08 mm., the annuli just half its total length and slender. Palpi pale yellowish, darker basad, the terminal joints subovoid, more swollen than in *opacus*, 0.42×0.75 mm. Thorax black and subshiny, the usual grayish lines, the tubercles reddish; wings, including costal cells, subhyaline with very slight clouding on the cross-veins, no spurs. Fore tarsal claws rather long, the outer ones about a quarter longer than the inner. Wallowa Co., Ore., vicinity of Wallowa Lake, June 23, 1934. C. B. Philip.

Even though certain females of the group have denuded subcalli, the males do not usually possess this character excepting in the case of *rhombicus* and the present species, if correctly assigned. In facies, the specimen resembles the male of *captonis* which, however, has a pollinose front, more reddish antennae, darker costal cell and more brown on the femora distally. Considering the similarity of the least infuscated females to *opacus*, it is surprising that the rows of pale spots on the abdomen are not more prominent in this male, as in those of *opacus*, and additional specimens may show this to be unusually reddish on the abdomen.

T. metabolus McDun. The describer had both sexes. I have 3 males which I refer to this species, 2 taken by myself in Ravalli Co. Mont., March 16 and May 7, the other by F. H. Snow in Estes Park, Colo. in August, 1896. The latter date is later by 2 months than any other record of either sex known to me, as it is an early species on the wing. Length, 17-18 mm., 3rd antennal segment 0.39×0.96 mm., 2nd palpal joint 0.48×0.72 mm. Very like *T. illotus* O. S. of which I have 18 ♂'s for comparison; although the latter are more shiny than their ♀'s, none has quite the enameled, robust appearance of *metabolus*, in addition to the differences noted in the key.

The females of these 2 species are far more easily separated, but larger

specimens of *metabolus* bear a superficial resemblance to *melanorhinus* Big. which also has a denuded subcallus. The more convergent front with piceous, convex callosities and deep transverse sulcus between them, more blackish antennae, and more slender, less sharply pointed palpal segments will separate females of the latter.

Specimens examined: Minn., 55 ♀; Man., 2 ♀; Ont. 1 ♂, 1 ♀; Alta., 1 ♀ (topoparatype); Mont., 1 ♂, 5 ♀; Colo., 1 ♀; Ill., 1 ♀.

T. minusculus Hine. The describer had both sexes. Male—10.5 to 11 mm. Apical segments of antennae and palpi slender (0.24×0.75 and 0.21×0.48 mm. respectively); the former reddish, darker on the annuli, hardly produced dorsally, palpi deep yellow and extremely slender. Thorax including the tubercles, dark. Abdomen with the dorso-lateral and ventral red reduced. Outer front tarsal claws slightly longer than the inner.

A female taken in muskegs near Carleton, Minn., July 15, 1932 by E. E. Tinkham extends the range of this small species westward.

T. nudus McDun. Eleven males of this species were taken at water in northern Minnesota along with those of *T. affinis* and *T. lasiophthalmus*, and described initially by me (1931). One of this series is hereby established as allotype and the description augmented. Length, 15 mm. 3rd antennal segment red, the annuli dark, strongly excised, 1.17 mm. in length by 0.45 mm. at the basal tooth; apical palpal segment pale yellowish, very swollen, 0.48×0.72 mm. Abdomen with the middorsal black stripe very narrow on the second segment and with diagonal dashes of pale hairs in the red on the sides of tergites 2 and 3. Outer fore tarsal claw very elongate. International Falls, Minn., July 3-5, 1924. C. B. Philip.

Specimens examined: Alaska, 1 ♀; Brit. Col., 1 ♀; Alta., 2 ♀; Mont., 5 ♀; Sask., 6 ♀; Man., 1 ♂, 2 ♀; Ont. 1 ♂, 1 ♀ (topoparatype); N. Bruns., 1 ♀; Me., 1 ♀; N. York, 1 ♀; Mich., 20 ♀; Minn., 13 ♂, 47 ♀.

T. opacus Coq. This species, with its 3 rows of distinct triangles and underlying, broad reddish sides on the abdomen, forms a transition with the *rhombicus* group of horseflies and, as mentioned elsewhere (Philip, 1936), Hine (1904) correctly described the ♂ although he undoubtedly had the ♀ confused with *hirtulus* Big. Length ♂, 12-13 mm.; third antennal segment slender (0.3×0.97 mm.) gently excavated and red only at the extreme base; second palpal segments buff, moderately swollen (0.36×0.66). Stump-veins on wings absent and fore tarsal claws subequal.

Specimens examined: Mont., 8 ♂ (reared), 23 ♀; Wyo., 3 ♀; Colo., 7 ♀; Utah, 48 ♀; northern Calif. 1 ♂, 1 ♀.

T. rupestris McDun. Allotype ♂, 14 mm. Essentially like the female, head rather small, eyes densely hirsute, vertical triangle raised above the upper eye level, but less so than in *atrobasis* ♂, frontal triangle much more swollen than the latter; antennae with first 2 segments (which are dark in *atrobasis*) and almost the basal half of the third red, shape as in ♀ but more slender (0.03×1.17 mm.); basal palpal segments black, with buff pile, the apical segments swollen (0.45×0.72 mm.) but less so than in *atrobasis*, with black and white pile intermixed. Facial pile dark along the ocular margins but pale below. Outer front tarsal claws nearly half again as long as the inner. Antealar tubercles black. Red on the sides of the abdomen pronounced, brighter than in *atrobasis*

and extending almost across the sides of the first tergite, but just a trace on the fourth. Incisures of first 3 tergites pale pilose expanding slightly in the middle of the 2 and 3, and a dash in the red laterally on 2; in *atrobasis*, the pale hairs are discontinuous across and the dash on 2 is lacking. Canyon Junction, Yellowstone Park, Wyo., July 5, 1926, C. B. Philip, hovering in sunlight filtering through a rather dense stand of fir.

The extent and intensity of the red on the abdomen and antennae vary in different specimens, as they do in the females, and involve the sides of the first abdominal segment in some specimens which would confuse assignment in the describer's key (1921).

Specimens examined: S. Dak., 6♂, 6♀; Mont., 6♂, 137 ♀; Wyo., 5♂ 10♀; Colo. 1♂, 3♀; Utah, 1♀; Ore., 1♂, 1♀; Brit. Col., 1♀; Alta. 9♀.

T. sonomensis O.S. A considerable amount of material from various western localities, together with study of the types of this and *T. phaenops* O.S. has convinced me of the impossibility of the satisfactory separation of the females at present. In extremes of variation, the integument of the face, palpi, antearlar tubercles, etc., is black hardly obscured by pollinosity. As now considered, this may well be composite, but hardly in the lines of separation indicated by Osten Sacken. Males were mentioned by Hine (1904), but some confusion of related species at the time, without adequate description makes knowledge of what he actually had before him inconclusive. All of the males I have are of the dark variety from southern Oregon and Topaz, Calif., including reared specimens associated by Webb and Wells (1924) with *T. phaenops*. Length 13-14 mm.; antennae black, third segment 0.36 x 1.05 mm. palpi smoky reddish, moderately swollen, 0.45 x 0.9 mm. Antearlar tubercles almost black, red on the sides of the abdomen reduced and very deep. Infrequent indications of short spurs at the fork of vein R_5 in some specimens. Fore tarsal claws subequal. Eyes (relaxed) with 3 abbreviated narrow purple stripes on a green ground which sets *sonomensis* apart from the immediate *affinis* relatives and suggests relationship with the eastern *daeckei*.

According to notes made by Hine at the British Museum, *T. maculifer* Big. and *T. phaenops* O.S. are the same. I have some intensely colored extremes of variation of what I take to be males of *T. frontalis* Wlk. from Alberta through H. E. Gray, which are difficult at present to distinguish from *sonomensis*. The observed variation makes this a difficult species to treat taxonomically, as seen by the several references in the subsequent keys. A reared male was reported by Cameron (1926).

Specimens examined: Brit. Col., 1♂, 15♀; Alta., 2♀; Wash., 9♀; Ore., 2♂, 32♀; Calif., 6♂, 21♀; Ariz., 2♀; Utah, 24♀; Ida., 1♂, 3♀; Mont. 26♀; Wyo., 18♀; Colo., 1♂, 27♀; N. Dak., 1♂; N. Mex., 1♀ (?).

T. trepidus McDun. Allotype ♂—15.5 mm. Pile of eyes relatively short. Antennae red, third segment slender (0.45 x 1.2 mm.) moderately excised, the annuli sharply black, less than half the length of the segment. Apical palpal articles deep yellowish, slender (0.39 x 0.84 mm.). Outer fore tarsal claw a little the longer. Antearlar tubercles reddish. Sides of the abdomen very broadly reddish, the median, dark interval markedly interrupted, the spot on the third

tergite, small elongate and isolated from both margins. Venter entirely reddish, darkening on the last 3 sternites. Columbia Cross-roads, Pa. July 4, 1931. R. M. Leonard, through Professor W. C. Stehr of Ohio University. Another male from Amherst, Mass., agrees.

The species is not common in any locality apparently, but observed across the entire southern Canada from Nova Scotia to British Columbia, and northern U. S. from New York to western Montana. Both sexes were reared by Stone (1930). I have a topoparatype through the kindness of the describer.

T. zygotus n. sp.

(Gr. - yoked or mated). A dark, medium-sized species of the "red-sided group" with predominantly black antennae and deep-yellowish, very slender, palpi in both sexes, the wings, including the costal margin, only slightly tinted. Hind tibial fringe predominantly black.

Female—14.5 mm. in length, eyes with very short, sparse hairs, and (relaxed) the usual subequal purple and green stripes, the upper and lower margins also purple; height of front about $3\frac{1}{2}$ times its inferior width, slightly though distinctly convergent below, smoky gray, with a tinge of buff and with dense short dark hairs; callosity piceous, rounded above and narrowly connected with the lanceolate median callus; subcallus grayish pollinose, not swollen. Face and cheeks, grayish pollinose and pilose. Antennae black, with only the basal fourth of the third segment reddish beneath, the latter 0.54×1.14 mm. in length and breadth, obtuse angulate dorsally and slightly excavated, a little taller than the first segment. Palpi, very slender, 0.42×1.62 mm., sickle rather than knee-shaped and deep yellow with appressed short black hairs. Thorax dark with faint gray vittae anteriorly; antealar tubercles, reddish on the disc, black marginally; scutellum black. Wings faintly yellowish without clouds, or spurs on the radial sector. Legs black, tibiae reddish basally, most extensive on the first 3 segments, extending ventrally to include most of the 2nd and 4th sternites, the black middorsal interval broad. A large triangle of golden yellowish hairs in the middle of tergite 2, and fringes of the same color on the incisures as well as over the venter.

Male.—15 mm. Differs from the female in the usual sexual characters; the pile of the eyes short but thick and whitish, upper facets little enlarged, vertical tubercle elongated, shining brown anteriorly, and raised above the upper eye level; frontal triangle flattened, dark, grayish pollinose. Antennae predominantly black, third segment 0.42 by 1.02 mm. First palpal articles black, the second deep yellowish, remarkably slender, subcylindrical, 0.3×0.84 mm. Integument of the body and legs sub-shining, thorax including the antealar tubercles, black, unlined; the black mid-dorsal band on the abdomen more restricted while the red is less extensive ventrally compared to the female. Outer fore tarsal claw almost a third longer than the inner.

Holotype and *allotype* on same pin with genitalia extruded, as if taken originally in copula. Crater Lake, Ore., 7000 ft., July 16, 1922. E. C. van Dyke. In the collection of the California Academy of Science.

Smaller than most *affinis* and *californicus*, the front of the female broader, antennae darker and shaped differently, the bodies darker, with paler wings

and subhyaline costal cell (not teneral), the palpi especially of the male, more slender. Compared to *trepidus* (paratype female) front of the female is broader, antennae darker and less wide, palpi little less slender, and red less extensive on abdomen; the broad front approaches *haemaphorus*, but the more slender, yellowish palpi and lack of wing clouds readily separate it. Compared to *cristatus* (paratype male), the palpi of the male are more elongated, antennae darker, the 2 basal segments black, not red, with less excavation of the third, and no evidence of the cristate groups of hairs on dorsum of the abdomen. Further collecting may provide females with entirely black antealar tubercles like the allo-type male, which would be misleading in the following key to females of the group.

While I have studied males of all recognized North American species of the *affinis* group, available numbers in several species are inadequate to give an idea of possible variation comparable to that known for the respective females in series; the key will therefore have to be used with some caution. Three species of the difficult *septentrionalis* group, i. e. *T. frontalis* Wlk., *T. mcisus* Wlk. and *T. canadensis* Curran, have been described with reddish laterally on the abdomen, although usually in the form of spots; being hardly within the scope of this discussion, these are called in the keys simply "*frontalis* group" due to the as yet inadequate understanding of geographic and specific limits. The males especially, of this and the *sonomensis* complex bear rather close resemblance to many of the *affinis* group, and, while their attempted inclusion in the keys has multiplied the difficulties of dichotomous treatment, reference in doubtful cases to the eye banding by brief relaxing in a moist chamber should aid in elimination of these, with narrow purple stripes on a green ground, from the *affinis* group with subequal purple and green stripes and purple lower border. It has not been possible with present moderate series to separate satisfactorily males of all *frontalis* from *sonomensis*.

A few species, the females of which are not ordinarily associated in the group, have males with considerable red laterally, and some of these also have been included in the following key.

KEY TO MALES OF THE AFFINIS GROUP AND CONFUSABLE SPECIES OF
NORTH AMERICAN HORSEFLIES.

1. Size small, not over 12 x 4 mm. in length and breadth; palpi very small and slender 2.
Size medium to large, usually over 12 x 4 mm. 3.
2. Face and palpi, shining black *hinei* Johns.
Face grayish pollinose, palpi deep yellowish *minusculus* Hine.
3. Femora almost entirely reddish or brownish 4.
Femora infuscated on basal half or more 5.
4. Red on sides of abdomen dull and diffuse; wings without spurs on the fork of R_5 *carolinensis* Macq.
Red on sides of abdomen with sharp, though irregular inner margins; short spurs present on R_5 *liorhinus* Philip
5. Femora reddish on distal $1/2$ to $1/3$; middorsal black stripe of the abdomen typically enclosing a narrow rather uniform pale line. (Atlantic Coast) *daeckei* Hine.

See p. 207.

- Femora with only the knees reddish; (except occasional *captivus* of Pacific Coast); pale, mid-dorsal maculations, if present, in form of triangles widened on the incisures 6.
6. Antalar tubercles black 7.
- Antalar tubercles reddish, at least on disc 10.
7. Size averaging under 14 mm.; antennae black; abdominal incisures not with prominent pale hairs; eye bands reduced (relaxed) *sonomensis* O.S. Size averaging over 14 mm.; 3rd antennal segments often red on about the basal third; abdominal incisures with prominent pale hairs; eye bands subequal (relaxed) 8.
8. Palpi very slender, subcylindrical *zygotus* n. sp. Palpi robust, subovoid 9.
9. Abdomen laterally bright reddish, the incisures with complete margins of pale hairs *rupestris* McDun. Abdomen laterally brown, the incisures, with pale hairs only middorsally the width of the black band *atrobasis* McDun. 22.
10. Frontal triangle above antennae entirely denuded, shining 11. Frontal triangle dull, grayish pollinose, at least over lower half 12.
11. Antalar tubercles black; red restricted to sides of tergites 2 and 3. *rhombicus* O.S. Antalar tubercles reddish; red on sides of abdomen more extensive *melanorhinus* Big. (?) 24.
12. Wings with distinct cloud, at least at the fork of vein R_5 13. Wings with veins often margined with brown but not a distinct isolated cloud on that fork 17.
13. Isolated clouds on all the outer cross-veins 14. Isolated clouds distinct only on the fork of R_5 16.
14. These clouds heavy; antennae red, the annuli sharply black *lasiophthalmus* Macq. These clouds faint but distinct; antennae with considerably more than the annuli infuscated 15.
15. Outer fore tarsal claw not markedly elongate; costal cell deep yellowish *metabolus* McDun. Outer fore tarsal claw almost a third longer than the inner; costal cell dilute yellowish *illotus* O.S. 28.
16. Size, robust, over 15 mm.; 3rd antennal segment reddish on the basal half, distinctly excavated *haemaphorus* Mart Size smaller, under 15 mm., 3rd antennal segment usually black, hardly angulated *sonomensis* O.S. 29.
17. Wings including costal cells subhyaline; abdominal pattern usually includes 3 rows of pale spots 18. Wings with costal cells distinctly, usually strongly tinted with yellow; rows of pale abdominal spots absent or faint 21.
18. Spurs present on "fork" of vein R_5 of wings 20. No such spurs 19.
19. Thoracic lines and rows of abdominal spots prominent; third antennal

- segment distinctly excavated, subequal in length to annuli *opacus* Coq.
 Thoracic lines fading posteriorly, abdominal pale spots frequently sub-
 obsolete; annuli distinctly shorter than the little excavated, basal portion
 of the third segment *frontalis* Wlk.
20. Outer fore tarsal claw about $\frac{1}{4}$ longer than the inner; antennae distinctly
 excavated dorsally *tetricus* var. *rubrilatus* Philip
 Fore tarsal claws subequal; antennae sometimes angulated but little ex-
 cavated dorsally some *frontalis* group.
21. Antennae predominantly red with a distinct dorsobasal angle or tooth,
 usually angulated; eyes (relaxed) usually with bands subequal, the lower
 border purple 22.
 Antennae usually predominantly black, less than the basal half of the third
 segment red, little angulated dorsally; eyes (relaxed) with narrow purple
 bands on a green ground 29.
22. Palpi very slender, length of second joints over twice their thickness 23.
 Palpi robust, thickness over half the length 24.
23. Red on sides of abdomen very extensive leaving the black interval very
 narrow, and no unusually prominent hairs middorsally
 *trepidus* McDun.
 Red reduced, leaving the black band broad on which are cristate groups
 of erect black hairs, especially prominent viewed laterally *cristatus* Cur.
24. Robust species, over 16 mm. in length 25.
 Medium sized species, under 16 mm. 26.
25. Third joint of antennae rather slender, strongly excised, the annuli less
 than half its total length and the infuscation extending onto the basal part;
 sides of abdomen bright reddish *affinis* Kby.
 Third joint proper almost as broad as long, gently excised, bright red, the
 annuli sharply black; abdomen yellow-brown laterally .. *californicus* Mart.
26. Antennae including the annuli, entirely reddish *epistates* O.S.
 Antennae infuscated distally, at least all the annuli 27.
27. Outer front tarsal claw slender and elongated at least a third more than the
 inner claw; apical palpal joint extremely swollen, almost round
 *nudus* McDun.
 Front tarsal claws subequal, or the outer but slightly elongated; palpi less
 robust, subovoid 28.
28. Third antennal segment slender, annuli only, black and longer than the
 basal portion; femora frequently with reduced infuscation distally
 *captonis* Mart.
 Third antennal segment with annuli usually shorter than basal segment,
 infuscation frequently extending basad of the annuli; femora black, knees
 reddish 29.
29. Body, particularly the abdomen, covered with a grayish pollinosity; mar-
 gins of middorsal black band jagged by expansion on the incisures
 *frontalis* group.
 Body dark, red on sides of abdomen deep, the black interval irregular
 longitudinally but not often jagged *sonomensis* O.S.
 (occasional *frontalis* Wlk.)

KEY TO FEMALES

1. Subcallus denuded, shining 2.
Subcallus dull, grayish pollinose 9.
2. Size small, 12 mm. or under; palpi unusually slender and short in relation to the tongue, face shining, dark, and sparsely pilose 3.
Size medium, usually over 12 mm.; palpi robust, often swollen, over $\frac{2}{3}$ the length of the tongue and stylets; face grayish pollinose and rather heavily pilose 4.
3. Wings with diffuse infuscation behind stigma reaching across radial and medial branches; callosity subquadrate, the palpi $\frac{2}{3}$ the length of the extended tongue *hinei* Johns. 13.
Wings with area behind stigma no darker than adjacent areas basally and distally; callosity transverse, the palpi little over half the length of the tongue *longiglossus* Philip. 14.
4. Legs including femora, reddish; eyes without discernible hairs; red on sides of abdomen diffuse, indefinite. (Eastern species) *carolinensis* Macq. 14.
Femora black on at least the basal half, with gray pollinosity; eyes distinctly hirsute, though often short; abdominal pattern well marked, the middorsal black with sharp margins 5.
5. Frontal callosity prominent, strongly convex and separated from subcallus by a deep transverse sulcus 6. 15.
Frontal callosity, small, flat, hardly elevated above its juncture with the subcallus, often rugose 8. 16.
6. Cross veins of wings with prominent isolated clouds *lasiophthalmus* Macq. 17.
These clouds absent or faint 7.
7. Antealar tubercles black; antennae, mostly black, rather slender, the dorso-basal prominence slight; front subparallel *rupestris* McDun. 17.
Antealar tubercles reddish; antennae red (annuli only, black), broad and chunky, dorso-basal tooth prominent; front strongly convergent below *captionis* Mart.
8. Sides of abdomen broadly red, usually enclosing yellowish dashes, the black interval narrow; bifurcation of R_5 ("fork") without spurs, and hardly clouded *nudus* McDun. 18.
Sides of abdomen with red confined to oblique dashes, the black interval broad and irregular; wings with isolated, though sometimes faint, clouds on the cross-veins, frequently with short spurs on the "fork" *metabolus* McDun.
9. Size small, under 12 mm. in length by 4 mm. across the thorax; palpi dark yellow, unusually slender *minusculus* Hine. 19.
Size medium to large, over 12 x 4 mm.; when small, palpi always robust and usually pallid 10.
10. Antealar tubercles entirely black; antennae predominantly black, rather slender 11.
Antealar tubercles reddish, at least on the disc; antennae often, not always, broad and reddish 12. 20.
11. Size large, usually over 15 mm.; first abdominal tergite usually black ..

- *atrobasis* McDun.
Size medium, under 15 mm.; tergite 1 laterally red .. occasional *sonomensis*.
12. Femora $1/3$ to $1/2$ reddish distally; wings uniformly dilute yellowish; palpi slender, pallid; abdomen with a rather uniform, slender, pale middorsal line its full length, superposed on the black *daecke* Hine. Femora infuscated, the knees (sometimes the middle pair a little more) reddish, and not with the above combination of characters 13.
13. Costal cell of wings deep yellowish; middorsal, black, abdominal stripe usually narrow; fairly regular 14.
Costal cell of wings subhyaline, little or not darker than the cells behind; middorsal black of abdomen usually composed of paired dashes (except *zygotus*), giving a serrated appearance, or the pattern often composed of 3 rows of spots or triangles 20.
14. Third segment of antennae predominantly red, (least extensive in *haemaphorus* which is seldom as small as 15 mm.) dorsally angulated and usually excavated; eyes (relaxed) with stripes subequal and lower border purple 15.
Antennae predominantly black, at most reddish basad of the slight dorsal angle; seldom over 14.5 mm. in length; ground color of eyes, including lower border, green with 3 narrow purple stripes *sonomensis* O.S.
15. Palpi very slender, deep yellow 16.
Palpi pallid or light yellowish and or noticeably thickened at the "knee" 19.
16. Third antennal segment broad basally, angulated but hardly excavated dorsally *trepidus* McDun.
Third antennal segment more narrow, strongly excavated dorsally 17.
17. Size over 16 mm.; front relatively wide, callosity convex and smooth, often transverse; sides of abdomen deep orange-red, the black interval usually narrow; excavation of antennae subrectangulate *affinis* Kirby.
*Size 16 mm. and under: front narrower below, the callosity subquadrate, flattened, and with fine, transverse wrinkles on the disc; sides yellow-red or -brown, the black interval comparatively wider; 3rd antennal segment acutely produced above (*gracilipalpis* Hine.
(*cristatus* Cur. (?))
18. Size large, 16 mm. and over; abdomen yellow-brown on sides; third antennal segment bright red, almost as broad as long, annuli fully as long and sharply black. (Pacific Coast) *californicus* Mart.
Size medium, usually under 16 mm.; abdomen reddish on sides; third antennal segment more elongated and markedly excised, and distinctly longer than the annuli 19.
19. Antennae entirely red, the annuli sometimes darker distally but seldom black; front narrow, the callosity small; R_5 without isolated cloud at "fork" *epistates* O.S.
Antennae black over almost the distal half; front rather broad, the callosity prominent; "fork" with a distinct cloud *haemaphorus* Mart.
20. Palpi deep yellow, slender *zygotus* n. sp.
Palpi pallid or creamy, often swollen basally 21.

*Separation of females of these 2 species from smaller variations of *affinis* is tentative and rather unsatisfactory with present meagre materials (see discussion of *cristatus*).

21. Sides of abdomen deep red encroaching on tergite 1 not more than half its width; "fork" of R_5 with a pronounced spur; front wide, convergent below, the callosity quadrangular *tetricus* var. *rubrilatus* Philip. Red, laterally, crossing tergite 1; spurs short or absent; front usually narrower or callosity rounded across the top 22.
22. Red on sides of abdomen extensive, enclosing series of yellowish, oblique dashes; size under 14 mm.; front rather broad, the callosity unusually convex and upper margin rounded; no spurs on R_5 ; eye stripes (relaxed) subequal, the lower border purple *opacus* Coq. Not with such combination of characters; eyes with three purple stripes, the lower border usually green *frontalis* group.

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NOTES ON NORTH AMERICAN NOCTUID GENERA.

BY J. MCDUNNOUGH,
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(continued from page 47)

ACRONICTINÆ

I employ this subfamily name as used by Hampson although I believe that in all probability it must be restricted to the genus *Acronicta* Ochs. and its few close allies, and the term *Amphipyryinae*, as used by Seitz in his *Macrolepidoptera of the World*, employed in its place.

Genus *Septis* Hbn. The scope of this genus must be considerably extended to include a number of species now placed in *Trachea*, following Hampson; in fact it will include most of the species listed by Smith in his revision (1890, Proc. U. S. N. M. XIII, 407) under *Xylophasia* Steph. which is a synonym of *Septis*. The male genitalia of the included species are remarkably homogeneous in structure, with their strong, trigonate, heavily spined cucullus and prominent ampulla projecting below its ventral margin. Incidentally it might be mentioned that our species now listed under *Agroperina* Hamp. and *Sidemia* Staud. show practically an identical type of genitalia, the genera being scarcely separable either from *Septis* or from one another; in any new arrangement they must follow directly after *Septis*. *Maillardi* Geyer with *alticola* Sm. (probably a mountain form of this

variable species) are certainly misplaced in *Eremobia*. The generic term *Crymodes* Gn. of which a form of *maillardi*, (*groenlandica* Dup.), was designated by Guenee as genotype, is, however, available and I would advocate its employment in a slightly extended way in place of *Sidcmia*; besides the above mentioned species and *murrayi* Gibs. one could include *devastator* Br. and possibly *longula* Grt., *burgessi* Morr. and *ona* Sm., the latter three being as well placed here as in *Septis* and certainly better placed than in *Luperina*, where they stand at present.

In this same group the genera *Trichoplexia* Hamp. and *Protagrotis* Hamp. should be included, and only slightly removed are those species still remaining under *Luperina* Bdv.; it is doubtful whether any of our North American species are strictly congeneric with the European *testacea* Schiff., the genotype of *Luperina* as designated by Duponchel (1829), but, lacking a better place, they may remain here for the present until further study can be made.

Genus *Trachea* Ochs. With genotype designated as the European species, *atrip-lialis* L., by Curtis in 1839, this generic term must revert to its earlier usage for the single North American species, *delicata* Grt., which on genitalic characters has little relationship to the *Septis* group. Of the large group of species now included under this name, a good few fall into *Septis*, as already noted; several others are better placed in *Oligia* Hbn., as will be noted later; for the two species, *turbulenta* Hbn. and *miselioides* Gn., respectively the genotypes of *Phosphila* Hbn. and *Helioscota* Grt., the former generic term is available with the latter as a synonym; the genus falls near *Trachea*. For a large remaining group no generic term seems available and I propose the following:—

Aseptis gen. nov.

Genotype: *Hadena genetrix* Grt. Related to *Septis* but with narrower primaries and with a strong excavation in outer margin of secondaries between veins 3 and 6. Eyes smooth. Palpi upturned, third joint smooth, conical, second joint heavily scaled and lightly fringed with hairs below. Vestiture of head and thorax composed of scales with moderately developed, divided, anterior and posterior thoracic tufts. Abdomen rather smooth-scaled with small dorsal tufts on basal segments and lateral hair at base. Pectus and femora hairy; tibiae smooth-scaled, unarmed. Male genitalia with claspers rather weak, narrow, and of practically even width throughout; cucullus slightly divided, with weak spines and a moderate corona. Harpe a curved hook, arising from a rod-like base and projecting (generally) over dorsal margin. Ampulla a strong spine projecting over ventral margin below division of cucullus (not always present). Sacculus weak. Uncus simple, rather long, curved and pointed apically. Tegumen broad with rather large, squarely exerted, basal extensions bearing the peniculus. Aedeagus short, chunky, variably armed with bunches of teeth or long spines.

The genus shows evident relationship on the one hand to *Septis* and on the other to *Oligia*, but the species belonging to it are easily recognized by the emargination of the hind-wings. On the whole the type of genitalia is remarkably similar but certain species such as *fumosa* Grt. and *characta* Grt. vary somewhat from the normal type.

Genus *Oligia* Hbn. The genitalia of the genotype, *strigilis* Cl., are slightly different from those of our North American species but not sufficiently so to war-

rant, in my opinion, a change of usage. *Miane* Steph. is a synonym. From *Trachea* as it now stands may be included *modica* Gn., *indirecta* Grt. and *tusa* Grt. and, for lack of a better place, *illocata* Wlk., *mactata* Gn. and *marina* Grt. although the types of genitalia of the two latter are rather aberrant. Of the species now included, the *fractilinea* group shows a rather divergent type of genitalia and *includens* Wlk. is incorrectly placed, as already noted, and is associated for the present with *inops* Grt. in the genus *Spartiniphaga* McD.

Genus *Eremobia* Steph. This monotypical genus, erected for the single European species, *ochroleuca* Schiff., is obviously wrongly employed for our North American species as the genitalia (*vide* Pierce, Pl. XXI) are quite dissimilar from those of any members of the strongly congeneric *claudens* group, now left under *Eremobia* after certain previously mentioned removals. As no generic term seems available I propose.

Eremobina gen. nov.

Genotype: Haden claudens Wlk. Eyes naked, rather small. Male antennae ciliate. Palpi upturned to just above front, (shorter than in *Eremobia*); third joint smooth-scaled, conical; second joint with rough hair beneath. Front with rather rough vestiture, projecting as a slight tuft. Vestiture of thorax rough, scaly, with moderate mesothoracic median tuft. Abdomen with strong dorsal tufts, especially on median segments (easily rubbed off). Pectus clothed with woolly hair. Tibiae with slight tufts of hair along outer edges. Forewings trigonate with decidedly convex outer margin. Male genitalia with clasper broadened basally, with fairly strong sacculus; otherwise of almost even width throughout, rounded apically, with faintly divided cucullus and a very weak corona. A strong rod-like ampulla projects considerably over ventral margin at base of cucullus and is more or less connected with apex of sacculus by a bar of chitin, parallel to ventral margin of clasper. Uncus simple. Tegumen broadened basally but not nearly so squarely exerted in the peniculus-bearing section as is the case in allied genera. Saccus broad and rounded apically. Vesica armed with a strong apical spine and a patch of fine spines.

The genus is allied to *Oligia* Hbn. and should be placed immediately following it in our lists.

Genus *Xylomoia* Staud. If our present listing is correct, which as yet I have not had the opportunity of verifying, then *Xylomoia* will be better placed close to *Oligia* as the type of genitalia is quite similar. This genus leads us over into some of the grass and reed-feeding forms. These include the genus *Benjaminiola* Strand (*Eubuchholzia* B. & B.), which, in spite of the latter authors reference to the *Hadeninae*, I believe better placed in this present association. *Archanara* Wlk., *Ommatostola* Grt., *Spartiniphaga* McD. and *Hypocoena* Hamp. also belong in the group, and to this latter genus I would transfer the species at present listed under *Calamia* Hbn. which was wrongly applied in the Check List, following a line of reasoning not in accordance with the International Rules (1916, Ent. News, XXVII, 399). Hampson's designation of *virens* L. as the genotype of *Calamia* seems to be the first valid one and must be accepted. *Ipimorpha* Hbn. appears also to be somewhat distantly related to the above mentioned genera.

Genus *Gortyna* Gn. Barnes and Benjamin have pointed out (1926, Bull.

Brook. Ent. Soc. XXI, 182) that the type of this genus was specified by Curtis (1829) as *flavago* D. & S. This designation must hold in spite of Grote's claims and my own faulty reasoning in the above mentioned paper. *Gortyna*, as used in our lists, must be replaced by *Hydroecia* Gn. (genotype *micacea* Esp.). This genus, together with *Helotrophe* Led., *Apamea* Ochs. and probably the *Papaipema* group, is, on genitalic characters, obviously related to the *Septis-Oligia* complex and I would advocate a removal of these genera from their present position and a placement that would more nearly indicate such relationship. With this section the *Septis-Oligia* group may be said to terminate.

Genus *Callopietria* Hbn. This genus contains at present some incongruous elements. *Floridensis* Gn. is the only species that may belong here; for *mollissima* Gn. *Haploolophus* Butl., of which it is the designated genotype, is available, and for the *monetifera* group we have *Euherrichia* Grt. (*Herrichia* Grt. *praeocc.*), Grote having designated the genotype as *monetifera* Gn. at the time of publication.

Genus *Pseudohadena* Alph. I have had no chance of examining the genitalia of the genotype but the single species placed by Barnes and Benjamin in this genus, *viz. vulnerea* Grt., obviously belong in the *Rhisagrotis-Andropolia* group.

Genus *Perigea* Gn. The genus is quite misplaced at present in association with *Oligia*. The genotype was designated by Grote (1874) as *xanthioides* Gn. and the genitalia of this species are distinctive enough from those of the other species listed under this heading to warrant the restriction of the generic name to this one species. For *cupentia* Cram. the term *Condica* Wlk. seems available and *thyatiroides* B. & B., a species unknown to me, may also fall here. The balance of the species go very nicely into *Platysenta* Grt. the genotype of which is *videns* Gn., with quite similar type of genitalia.

Genus *Draudtia* B. & B. In an endeavor to clear up some of the muddle in connection with the species listed under *Namangana* Staud. Barnes and Benjamin proposed the name *Draudtia* to replace it more or less for our North American species, with genotype designated as *revellata* B. & B. (1926 Pan Pac. Ent. III, 66). Unfortunately the typical section contains species whose genitalia are so similar to those of the species of *Platysenta* that the necessity for the generic name is uncertain. For the present it may be retained for the group centered around *revellata* and comprising *leucorena* Sm., *andrena* Sm., *funeralis* Hill, *morsa* Sm., *begallo* Barnes and presumably *ignota* B. & B. The balance of the species transferred from *Namangana* are certainly not congeneric with this group; *texana* Sm. and its close ally or race, *variabilis* B. & McD., have a type of genitalia which would throw the species into the Hadenine genus *Orthodes* Gn., close to *alfkenii* Grt., and in spite of the fact that I can discover no hairs on the eyes I favor this transfer on account of the similarity of habitus. The species, *epipaschia* Grt., (*praeacuta* Sm.) seems to show relationship to the species under *Chytonix* Grt. but lacks the strong abdominal tufting. I propose the following genus to contain it.

Achytonix gen. nov.

Genotype: *Homohadena epipaschia* Grt. Very similar to *Chytonix* Grt. but without the dorsal abdominal tufting. Palpi rather longer and with more hairs

on second joint below. Male genitalia with rather weak claspers, of even width throughout, sparsely haired and without well-differentiated cucullus. Corona absent. Harpe a strong curved hook with rod-like base, projecting well over costal margin of clasper near base. Sacculus weak and confined to extreme basal section. Uncus cygnated. Tegumen long, narrow with poorly developed peniculus. Aedeagus short, chunky; vesica armed with long spine.

The balance of the species in *Draudtia* comprise what may be called the *continens* group which Barnes and Benjamin correctly associated with the Cuculliine genus *Properigea* B. & B. (1927, Pan Pac. Ent. III, 112). However as the lashed eyes are wanting in these species it seems necessary to create a new generic term.

Neperigea gen. nov.

Genotype: *Perigea continens* Hy. Edw. Very similar to *Properigea* B. & B. both in habitus and male genitalia but lacking the lashed eyes. Palpi upturned to middle of front, third joint short and slightly porrected, second joint heavily but smoothly clothed with scales. Thorax clothed rather smoothly with an admixture of fine scales and hair and without any obvious tufting. Abdomen smooth, with some long hair at base but no obvious dorsal tufts. Male genitalia with clasper broad in basal half with convex ventral margin, narrowed abruptly to one-half and bent at right angles to form the cucullus which is moderately battledore-shaped and heavily spined. Harpe a bulbed spine, more or less parallel to plane of clasper and raised in apical half. Uncus simple. Tegumen very much broadened basally with strong peniculus. Aedeagus armed apically with short teeth; vesica with long strong spine.

Although slightly divergent, *niveirena* Harv., *albimacula* B. & McD. and presumably *perolivalis* B. & McD., which is not before me, may conveniently be placed in this genus.

Genus *Caradrina* Ochs. In place of *Caradrina*, which has been referred to the *Agrotinae* in my revision, Barnes and Benjamin suggest a re-employment of *Athetis* Hbn. (1925, Pan Pac. Ent. II, 19) with genotype *dasychira* Hbn. As a matter of fact our North American species are not, according to genitalia, congeneric with the European species, and the employment of *Athetis* would be incorrect. For *tarda* Gn., with totally different genitalia, the term *Anorthodes* Sm. is available and with this species might be associated for the present *triquetra* Grt. and its ally *indigena* B. & B., although it is likely that eventually a new generic term for these two species will be necessary. The balance of the species very evidently, on genitalic structure, fall into *Platyperigea* Sm. (genotype *camina* Sm.) which disposes very satisfactorily of the difficulty. *Anotha* Dyar, at present placed in *Platyperigea*, cannot remain here nor can it go in *Petilampa* Auriv. as listed by Hampson; I associate it with *posticata* Harv., at present in *Luperina*, and propose the following new generic term.

Protoperigea gen. nov.

Genotype: *Platyperigea anotha* Dyar. Proboscis developed. Antennae of male ciliate, of female simple. Eyes naked. Palpi upturned to middle of front, smoothly clothed with scales; third joint short, chunky, partly concealed in vestiture of second joint. Front smooth, rather roughly clothed with hair-like scales.

Vestiture of thorax composed of scales and hair-like scales, without obvious tufting. Abdomen smoothly scaled with some rough hair at base and no dorsal tufts. Pectus hairy. Legs with hair-fringes dorsally on tibiae of last two pairs. Male genitalia with heavily chitinized claspers, the membranous portion restricted to a small section at extreme apex of cucullus, on the costa of which is a large, raised and folded truncate piece of chitin; no corona. Harpe a small finger-like projection, extending slightly beyond costal margin. Sacculus strong, raised, and bent backward towards costa, forming with the lower portion of clasper a hollow sac. Uncus simple. Tegumen broad, with the peniculus situated on a squarely exerted basal area. Juxta strongly developed and forming a dorsal sheath around the aedeagus which is long and curved. Vesica armed with long strip of teeth and an apical plate with finely dentate edge.

Posticata Harv. besides having a general similarity of habitus to *anocha*, is not dissimilar in genitalia, differing in minor characters relating to the more prominent harpe, the shape of the apical chitinous piece and the armature of the vesica; the whole clasper is still more heavily chitinized than is the case with *anocha*.

The placement of the genus is difficult but for the present I leave it in the neighborhood of *Platyperigea*.

Genus *Prorachia* Hamp. Judging by the genitalia of the genotype, *daria* Druce, the placement of *Prorachia* in the *Acontiinae* would probably be more correct; there are ventral hair pencils on the eighth abdominal segment, a feature seldom found in the *Acronictinae*; the type of squamation is also essentially *Acontinae*. Vein 5 of secondaries is, ~~is~~ is true, weak from below middle of discocellulars but this also occurs in *Ponomotia* H. S. (*Graeperia* Grt.), near which genus *Prorachia* might be placed.

Genus *Copibryophila* Sm. This is another genus that I believe must be placed in the *Acontiinae*. The male genitalia of the genotype, *angelica* Sm., show hair pencils at the base of the genitalia, the squamation is smooth and scaly as is usual in this subfamily and vein 5 of the secondaries, while weak, is well below the middle of the discocellulars, veins 3 and 4 being shortly stalked.

Genus *Aleptina* Dyar. In the genotype, *inca* Dyar, vein 5 of secondaries is quite well-developed and originates rather close to 3 and 4 which are generally shortly stalked. The general similarity of appearance to *Paracretonia* Dyar leads to the belief that it would be better placed next to this genus in the *Acontiinae*.

ACONTIINAE

Barnes and Benjammin have shown (1926 Bull. Brook. Ent. Soc. XXI, 183) that with the genotype of *Acontia* Ochs. designated by Duponchel (1829) as *solaris* Schiff. (*lucida* Hfn.), the subfamily name, *Acontiinae*, must be used in place of *Erastrinae*, as employed by Hampson. It seems probable that *Tarache* Hbn. will in this case sink to *Acontia* Ochs.

As used at present in our lists the subfamily appears rather poorly defined and full of incongruous elements, the position and strength of vein 5 being quite variable, and the genitalia in many cases being quite impossible to co-relate; an intensive study of our North American species in connection with the West Indian and Central American fauna will probably be necessary before relationships can be worked out. The only homogeneous group as regards genitalia are the

true Acontias comprising the genera of our lists from *Heliocentia* on. In these the genitalia are faintly reminiscent of the Heliothid group and there is a noticeable frequency of hair pencils on the eighth abdominal segment. Possibly at some later date it will be possible to restrict the subfamily to this group.

Genus *Erastria* Ochs. Barnes and Benjamin have discussed (1926, Bull. Brook. Ent. Soc. XXI, 183) at some length the validity of this name and, being staunch advocates of the "Tentamen," have sunk *Erastria* Ochs. (1816) (type *uncana* L., designated by Curtis, 1826) as a homonym of *Erastria* Hbn. (1806) a Geometrid genus. However with the definite ruling of the International Committee on Nomenclature invalidating the "Tentamen," such action is *ultra vires*. This, unfortunately, (or fortunately according to the view point) does not clear up the situation as, owing to the discovery of an unknown prospectus and a pamphlet by Hubner, as noted recently by Hemming (1935, Stylops, IV, 36-46), it is possible that *Erastria* Hbn. can be credited to Hubner (1814) on the strength of its usage on Plate CCIII of the Sammlung Exot. Schmett. for a Geometrid. This whole complicated matter should, to my mind, be referred to the International Committee for a ruling and until such is done, I prefer to continue the usual usage of crediting *Erastria* to Ochseneheimer (1816) in the interests of stability of nomenclature.

With *uncana* L. as genotype, *Erastria* Ochs. (1816) takes priority over *Lithacodia* Hbn. (1818), a monotypical genus of the "Zutraege" for our North American *bellicula* Hbn. The genitalia of these two genotypes are very closely related and in fact the species are so similar in general appearance that it is a wonder the above synonymy has not been previously noted. As at present listed the species of the genus *Erastria* (*Lithacodia*) are a very mixed lot with very varied genitalia; the typical form is illustrated by Pierce (Genit. Brit. Noct. Pl. XXX, as *unca*) and the only other of our species which might conceivably be associated with it on genitalic characters are *muscosula* Gn. and *albidula* Gn., and even these are not very close on several characters. It is probable that eventually several new generic terms will be needed in this group but for the present I confine myself to proposing a new genus to contain *apitosa* Haw. and its close ally, *caduca* Grt., as noted by Barnes and Benjamin (*op. cit.* 184).

***Neoeastria* gen. nov.**

Genotype: Phytometra apicosa Haw. Palpi upturned to well above front, smooth-scaled, third joint long, pointed. Eyes naked. Antennae ciliate. Front smooth. Thoracic vestiture smooth, scaly, with a strong, partly divided scale-tuft on medio-posterior margin. Abdominal vestiture scaly, with distinct median tufts on all abdominal segments except the final one. Primaries trigonate with rounded apex and a distinct angle at vein 3, venation normal, with areole; secondaries with vein 5 somewhat weaker than veins 3 and 4, parallel to 4 and arising slightly below middle of discocellulars. Male genitalia rather Heliothid-like; claspers long, narrow, slightly broadening apically; cucullus brush-like but without corona. Harpe a curved pointed hook, bent towards costal margin basad of the middle of clasper, and attached to the apex of the rather weak sacculus. Tegumen long, evenly conical, square-cut apically with weak simple uncus and no peniculus. Saccus rather long, V-shaped. Aedeagus chunky, without armature.

Distinguished at once from *Erastria* proper by the wing-shape. The genitalia are quite dissimilar to those of *uncula*. In *bellicula*, the genotype of *Lithacodia*, the three basal abdominal segments only possess small hair-tufts, easily rubbed off. I have not had the opportunity of examining fresh specimens of *uncula*.

For the species now listed under *Erastria* and which were formerly included in *Tripudia* Grt. there appears no generic term available; they cannot be transferred to *Cobubatha* Wlk. (*Tripudia* Grt.) on account of the wing venation of primaries which is normal, with areole, whereas in the genotype of *Tripudia* (*quadrifera* Zell.) the areole is wanting and veins 8-10 are stalked. *Eustrotia* Hbn. is also not available as it is a direct synonym of *Erastria*.

Nerastria gen. nov.

Genotype: *Eustrotia dividua* Grt. Proboscis developed. Palpi upturned to well above front, smooth-scaled, third joint long and pointed. Front slightly bulging. Thoracic vestiture smooth, scaly, with no definite tufting. Abdomen smooth-scaled, with small dorsal tuft on basal segment only. Legs smooth-scaled, mid- and hind tibiae with small median and terminal hair-tufts. Forewings trigonate with evenly convex outer margin, venation normal, with areole; secondaries with vein 5 moderately strong and somewhat bent at base, approaching slightly origin of 3 and 4.

In the male genitalia the claspers are of even width throughout and without armature; the sacculus is rather weak and tapers off to a point, ending, as a slight thickening along the ventral edge of clasper, near apex; corona very weak, represented by a few costo-apical spines, slightly heavier than remainder of apical hairs. Uncus simple; tegumen evenly conical and rather narrow; saccus with a long, narrow, pointed apex. Aedeagus terminating in a broad corneous hook; vesica armed with a strongly bulbed thorn.

CATOCALINAE

Genus *Caenurgia* Wlk. As employed in our present lists the genus contains very heterogeneous elements; it will be necessary to restrict it to the species *convalescens* Gn., the genotype, and the closely allied species *togataria* Wlk. The group comprising the species *intercalaris* Grt., *diagonalis* Dyar and *triangula* B. & McD. belongs in the genus *Euclidimera* Hamp., showing great similarity in male genitalia with the genotype, the European *mi* Cl., the genitalia of which are figured by Pierce (*l. c.* Pl. 31). The two species at present erroneously listed under *Euclidimera*, viz. *annexa* Hy. Edw. and *caerulea* Grt. form, along with the balance of the species from *Caenurgia*, viz. *erechtea* Cram., *crassiuscula* Haw. and *distincta* Neum. a very compact group for which unfortunately no generic term appears to be available; *Drasteria* Hbn. cannot be employed, as was wrongly done by Grote and others, as it was first proposed in the "Zutraege" (1818) and not in the "Verzeichniss" (1825); the genotype is *graphica* Hbn. (B. & McD. 1916, Ent. News, XXVII, 399; Hampson, 1926, Desc. New Gen. Lep. Phal. 38) and it takes priority over *Syneda* Gn. the type of which was designated by Grote (1874) as this same species. I propose therefore:—

Caenurgina gen. nov.

Genotype: *Drasteria caerulea* Grt. Eyes rather small, slightly reniform. Palpi

upturned to just beyond front, third joint short, conical; second joint hairy below. Front smooth, with small hair-tuft. Male antennae ciliate. Thorax clothed with rough hair, mixed with scales on the patagia and without tufts. Abdomen sparsely haired over a basal layer of scales, untufted. Tibiae all spined, smoothly scaled; rough hairs at base of legs and on femora. Forewings rather narrowly trigonate with slightly rounded apex and moderately convex margin; venation normal. Male genitalia asymmetrical; clasper rather narrow, costal portion thickened with chitin and produced to a point beyond the rounded termination of the membranous portion. On the right side near base a strong chitinous rod projects beyond costa; this is lacking on left side, being replaced by a flat apical rod, near and parallel to ventral margin and terminating, in a slightly raised and blunt point, near rounded apex of membranous portion of clasper. Sacculus asymmetrical; on right side it terminates in long curved hook-like projection from the base of which a stout spine projects at right angles; on left side the terminal projection is shorter and blunter and the place of the lateral spine is occupied by a rounded hump covered with short hair. Uncus short, stout, terminating in a sharp spine. Aedeagus long, narrow; vesica armed with several bulbed spines.

This type of genitalia prevails throughout the included species. There is individual variation in the length and position of the armature of the claspers on both right and left sides, *erechtea* in this respect being the most atypical. The hairy prominence on the left sacculus is constant as are the bulbed spines in the armature of the vesica.

Genus *Euclidia* Ochs. The genotype was specified by Duponchel (1829) as *glyphica* Linn. and the genitalia of this European species show little resemblance to those of our North American species, *cuspeida* Hbn., now included under this generic heading. A new genus seems called for and I propose.

***Euclidina* gen. nov.**

Genotype: Drasteria cuspeida Hbn. Eyes moderately large, rounded. Palpi upturned to just above front, third joint smooth, conical; second joint thickly but rather smoothly clothed with scales, intermixed with hair. Male antennae finely ciliate. Head and thorax rather smoothly clothed with scales and hair, with broad scales on patagia and a moderate metathoracic tuft; abdomen with smooth vestiture and slightly dorsal tuft on basal segment. Fore tibiae unspined; mid tibiae with an inner row of well-developed spines; hind tibiae weakly spined. Pectus hairy, femora moderately hairy, tibiae clothed with short hair, tarsi smooth. Primaries rather broadly trigonate, with slightly rounded apex and convex outer margin; venation normal. Male genitalia asymmetrical. Claspers narrow, rather heavily chitinized, rounded apically and without corona or hair on cucullus; at base short arms project over costal margin; on right side this arm is bent, rather flattened, strongly expanded apically, and sparsely covered with short hair; on left side it forms a large conical tubercle, somewhat roughened and clothed with short hair. These arms are attached to the apices of the rather strong sacculus which on the left side shows some irregularly curled-up pieces of chitin near its apex. Aedeagus long, thin, unarmed. Uncus short, broadly tongue-shaped, with dorsal ridge. Saccus rounded, not projecting backward.

A NORTH AMERICAN ONCOPODURA (COLLEMBOLA).

BY HARLOW B. MILLS,
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One does not usually associate springtails with snakes. Nevertheless a snake was indirectly responsible for the discovery of the first North American representative of the interesting and peculiar Collembolan genus *Oncopodura*. In 1932 Professor J. E. Guthrie received a snake from Mr. O. C. Van Hying of Marianna, Florida, mailed alive in moss. Instead of discarding the moss, Professor Guthrie requested that its Arthropod fauna be extracted.

Not only were mites obtained in numbers, but several hundred Proturans and ten specimens of Collembola were found to be stowaways in the snake box. The Collembola were all *Oncopodurans*.

Four species have been referred to this genus since its erection by Carl and Lebedinsky in 1905*, all from the Palaearctic Region, and the occurrence of any one of these in the Western Hemisphere would have been of more than passing interest. The little American, the smallest species in the genus, belonged to none of the recognized forms; indeed, in the shape of the peculiar sense organ at the tip of the antennae it is unique in the Order Collembola.

All of the specimens were somewhat rubbed and injured in transit, but in sufficiently good condition to allow description.

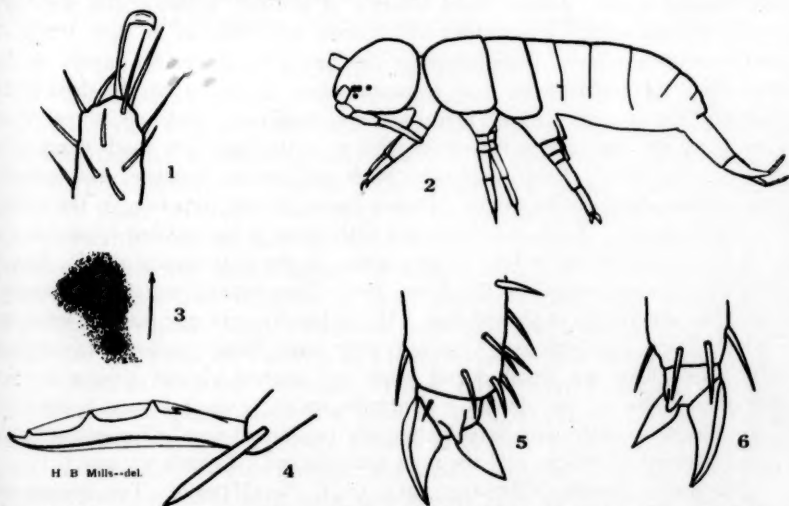


Figure 1, Apex σ antenna. Figure 2, Lateral view. Figure 3, Eyes left side. Figure 4, Right mucro. Figure 5, Right hind foot. Figure 6, Left front foot.

***Oncopodura oculata* n. sp.**

Color gray to the naked eye, pigment blue-gray, punctate, the spots often uniting to form weak reticulation. Antennae gray. Head with a light inverted V on the vertex the arms of which reach forward and outward toward the eyespots. Legs gray, lighter distally. Manubrium gray, lighter toward the apex.

*Carl and Lebedinsky, 1905, Materialien zur Hohlenfauna der Krim. II. Ein neuer Typus von Hohlenapterygoten. Zool. Anz. Bd. 28; s. 562-565.

Dens uncolored. Immature specimens white but for the eyespots. Eyes four on either side as in fig. 3, on diffuse black eyespots. Antenna four segmented, segments I and II subcylindrical, III enlarging apically, IV elongate cylindrical, irregularly blunt at apex and not annulate. Antennae slightly longer than the head diagonal, about as 23:19; the segmental proportions about as 21:25:37:51, all segments bearing short hairs and I with scales similar to those of the head and body. Organ of segment III composed of two elongate-elliptical sense clubs and two curving hairs. Apex of segment IV (fig. 1) bearing a large, erect sense club which recurves distally, the recurved portion expanded and apparently tricarinate. Other sensillae of the antennae not seen. Postantennal organ not seen. Thorough search was impossible with scarcity of material on hand. Head and body scaled with small, hyaline, oval, elliptical or pointed scales which are closely appressed. Weakly fringed hairs present on the genae, and sides of the thorax and abdomen. On the latter two divisions these hairs are interspersed with larger, clavate, truncate, strongly fringed, hyaline appendages. Pronotum scarcely visible dorsally. Abdomen with some smooth, pointed hairs dorsally at the apex. Segmental lengths from head to abdominal segment VI exclusive of the prothorax about as 68:40:24:22:22:27:30:19:12, segment IV thus slightly longer than segment III. Legs covered with rather heavy bristles, more slender apically on the tibiotarsus. Precoxae of the two posterior pairs with two long, weakly fringed hairs. Tenent hairs absent. If present, bothriotricha were not seen or had been shed. Unguiculus and unguis unarmed, as in figs. 5 and 6. Praetarsus with a minute bristle on either side and a small, conical papilla on the anterior face. Manubrium to dens to mucro about as 59:52:26, the dens twice the mucro. Mucro (fig. 4) with apical and subapical teeth, and two others, blunt and erect, on the shaft; also furnished with an acute lamellate tooth dorsally a third from the base. Erect mucronal teeth supporting lamellae, and ventral lamella present along entire length. Dentes broad basally, tapering in the apical half to the mucrones. Each arm furnished with seven heavy pointed spines on the inner face and with three or four similar spines on the outer apical third. About seven heavy, fringed plumes on the dorsal face. Two heavy, long spines apically, one on either side of the mucronal base. Dorso-basally with one smooth, suberect hair which is not conspicuous. Ventrally with many heavy scales. Manubrium dorsally with about ten small dorsal setae and several plumes similar to but smaller than those of the dentes. Ventrally scaled. Ventral tube cylindrical with six minute smooth hairs surrounding the two apical sacs. Tenaculum with the corpus devoid of bristles and the rami four-toothed. Length 0.5 mm.

Marianna, Florida, February, 1932, O. C. VanHying. Ten specimens, four adult and six juvenile from moss.

Types at present in my collection.

This species separates itself readily from other members of the genus, notably in its color, the presence of eyes, and the peculiar sense club at the apex of the antenna. It forms a natural subdivision of *Oncopodura* which is doubtless of at least subgeneric ranking.

The known species of the genus may be keyed out as follows:

1. Eyes present, color gray *oculata* n. sp.

- Eyes absent, white species 2.
2. One large, fringed hair dorsally on each dens at the base 3.
- Four or five large fringed hairs dorsally on each dens 4.
3. Praetarsus bearing a conical papilla near the base of the unguiculus; post-antennal organ present (England, Poland, Hungary)
crassicornis Shoebbotham, 1911.
- Praetarsus without a conical papilla near the base of the unguiculus; post-antennal organ absent (Spain and France) *occidentalis* Bonet, 1931.
4. Praetarsus with three conical papillae, one on the anterior face and two on the posterior face. Postantennal organ present (Jugoslavia)
jugoslavica Absolon and Kseneman 1932.
- Praetarsus without conical papillae, postantennal organ absent (Crimea)
hamata Carl and Lebedinsky 1905.

Since the above was written a review of the genus by Dr. Jan Stach (Die Gattung *Oncopodura* Carl & Leb. und eine neue Art derselben aus den Hohlen nord ostl. Italiens, Bull. Acad. Pol. Sci. et Let., Ser. B, Sci. Nat. (II), pp. 1-16, 1934) has come to hand. This paper describes *O. cavernarum* n. sp. from the caves of northeast Italy. *O. cavernarum* is similar to *O. oculata* in that the large dorso-basal hair of the dens is bare and not especially conspicuous. It is, however, white, eyeless, and a simple, sac-like postantennal organ is present. In other species which possess postantennal organs, these structures are compound, composed of from four to six triangular tubercles arranged in the form of a rosette.

RESEARCH NOTES

INTERESTING MOTHS COLLECTED AT GRAND BEND, ONTARIO, 1936

As a rule very profitable insect collecting can be carried on with sugar lines, bait traps, or at flowering wild plants in the vicinity of the Entomological Laboratory at Strathroy, Ontario. The results with these methods in 1936 were very poor. However, collections at electric lights proved to be not only most productive, but the material secured was of unusual interest. Some 244 species of moths were taken during the season, of which one species, *Lithacodia caduca* form *retis* Grt., furnished a first Canadian record. Four of the species, *Sideridis congermana* Morr., *Rhodocia aurantiago* Gn., *Prionapteryx nebulifera* Steph., and *Hyparpax aurora* A. & S., proved to be the first records from Ontario in the Canadian National Collection. Other forms worthy of note include the normally western species *Macaria denticulata* Wlk., *Protagrotis extensa* Sm., and *Ambesa laetella* Grt.; the northern *Odontosia elegans* A. & S.; certain southern species *Diacrisia latipennis* Stretch, *Apatelodes angelica* Grt., and *Catopyrrha coloraria* Fabr., together with some rare species such as *Dasylophia thyatiroides* Wlk., (dark form), *Panthia furcilla* Pack., *Hormisa orciferalis* Wlk., *Hormisa bivittata* Grt., and *Eulia alisellana* Rob.

We are indebted to Dr. J. McDunnough for the determination of the material.

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NOTE IN REGARD TO THE FLIGHT PERIOD OF JUNE BEETLES AT GRAND BEND, ONTARIO, 1936

Continuing the observations upon June beetles, (*Phyllophaga* spp.), start-

ed in 1935 at Grand Bend, Ontario, and reported upon in a paper before this Society in that year, (Rep. Ent. Soc. Ont. 66, 39-42) a sketch study of the flight periods of the several species present was carried on in 1936. The observations were made at an electric light used to illuminate a gasoline station within a mile of the point of study in 1935 and in the same general vegetational environment. The beetles coming to the light were captured with a net each night upon which beetles were seen to be in flight throughout the period between May 23 and September 9—May 23 being the date at which flights became noticeable at Strathroy, some forty miles southeast of the point of study. Six hundred and sixty-two specimens were taken and after determination proved to represent eleven species, which included the nine species reported as taken in the vicinity in 1935, together with *P. longispina* Sm. and *P. gracilis* Burm.; the latter had also been taken in 1935 but had not been determined till after the report of 1935 had been forwarded for publication.

The recoveries from time to time were not upon a sufficiently standardized basis to make the several records more than approximately comparable, yet taken together certainly show very interesting variations in the flight periods of the several species. The relative abundance of the different species as between the collection from food plants in 1935 and the recoveries at the light in 1936 proved to be in no way comparable. *P. tristis* Fab., for example, which was taken in 1935 in greatest number of the nine species reported upon, ranked eighth on the list at the light in 1936.

Of the eleven species taken, *P. longispina* Sm. was represented by but one specimen taken on May 23, and *P. fusca* Froel. (3 specimens) was not taken after May 24. *P. futilis* Lec. (8 specimens) was present from May 23 to June 13. *P. crenulata* Froel. (58 specimens) was present from May 23 till August 13, the bulk of the flight seeming to be in May and June. *P. ilicis* Knoch. (83 specimens) also was present from May to August and twenty specimens were recovered between August 1 and 21, the bulk of the flight, however, seeming to be in June and July. Five species came to the light during the three months May, June and July—*P. anxia* Lec. (46 specimens) between May 23 and July 15 (?), the great flight occurring in May, *P. rugosa* Mels. (72 specimens) between May 23 and July 31 (?), with the bulk of flight in May and June, *P. drakei* Kby. (123 specimens) between May 23 and July 12, but one specimen being taken in July, *P. tristis* Fabr. (22 specimens) between May 23 and July 8, and flying freely in May and June, only one specimen in this case, also, being taken in July, and *P. marginalis* Lec. (37 specimens) between May 23 and July 8 was not really abundant at any period of the flight period. The flight of *P. gracilis* (209 specimens) did not begin until July 12 and continued until September 9, the species being most abundant in August when 171 were taken. Of the latter, an interesting feature was that in sharp contrast to the other species in which the catches were preponderantly male, 60 per cent of the recovery of this late flying form proved to be females.

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NEWS AND VIEWS

DEATHS OF PROMINENT ENTOMOLOGISTS

It has been with considerable regret that the death notices have been recently noted of several outstanding workers in the field of entomology. On September 24th, 1936, *Dr. J. W. Folsom*, entomologist in the Division of Cotton Insect Investigations, Bureau of Entomology, United States Department of Agriculture, at Tallulah, Louisiana, died at Vicksburg, Mississippi, after an illness following heart attacks. Dr. Folsom was 65 years old. On January 11th, 1937, *Professor Cyrus R. Crosby*, professor of entomology at Cornell University, died on his arrival in Rochester for the annual meeting of the New York State Horticultural Society. He was 58 years old. *Professor Robin Tillyard*, an honorary fellow of Queen's College, Cambridge, was killed in an automobile accident, on January 13th, 1937. Dr. Tillyard was 55 years old and from 1928 to 1934 was chief entomologist of the Commonwealth of Australia.

ANOTHER BIG GRASSHOPPER YEAR INDICATED BY SURVEYS IN WESTERN UNITED STATES

Officials of the U. S. Department of Agriculture state, in a recent press release, that grasshopper activity for 1937 is less predictable than for any other season since they started making annual surveys of this pest. Delayed and erratic egg laying—the result of the abnormal weather of 1936—and lack of time for thorough scouting for eggs in the ground last fall—because winter closed in so soon—have made it difficult to forecast the numbers of hoppers likely to hatch next year, according to Lee A. Strong, Chief of the Bureau of Entomology and Plant Quarantine. Present indications, however, point to serious outbreaks in Illinois, Missouri, Iowa, Nebraska, Kansas, North Dakota, Montana, Wyoming, and Colorado and to less serious infestations in Michigan, Wisconsin, South Dakota, and Oklahoma.

NEW CHEMICALS PROMISE AID IN INSECT CONTROL

Out of the thousand or so potential insecticides that have come from the chemists' test tubes in the last few years, three or four now show definite promise as valuable aids to the farmer in his never-ending war on insect pests of crops, particularly fruit. None of them, however, can yet be recommended for general use. Further work must be done to iron out certain difficulties in the economical manufacture or practical application of each, according to Lee A. Strong, Chief of the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

The most promising of the department's newest insecticide discoveries, Mr. Strong says, is phenothiazine, a compound of carbon, hydrogen, nitrogen, and sulphur that is easily prepared by combining diphenylamine—a common aniline derivative—and sulphur. After preliminary tests in the laboratory had shown that it killed the larvae of mosquitoes and of the codling moth exposed to it, phenothiazine was taken out into the field for a limited trial. When it gave promise in these small-scale tests, it was put through a course of large-scale field tests. The results of these tests, though in the main highly encouraging in the Northwest, show the need for more study.

In the Northwest phenothiazine controls the codling moth—Number 1 apple insect pest—much better than lead arsenate, for many years the apple grower's main standby, but now generally considered far short of the ideal insecticide. Chief advantages of phenothiazine are that it keeps down the number of stings made on fruit by the worms, and that the residue it leaves is less likely than lead or arsenic to injure human consumers of the treated food products.

The main obstacle to the widespread use of phenothiazine in northwestern orchards is its effect on the skin of those who handle it. Many orchard men, particularly sprayers, using it are afflicted with what looks—and feels—like a severe sun burn. Sometimes also apples treated with phenothiazine are paler than untreated fruit. The department is making every effort to discover ways for overcoming the few objectionable features in spraying or dusting with phenothiazine.

Another possible substitute for lead arsenate suggested by the chemists is nicotine in a form that will stick on fruit and foliage long enough to accomplish its purpose. Bentonite—a natural clay of volcanic origin, found in Wyoming, California, and other nearby States—can be made to unite with nicotine by mixing it with a salt of nicotine, such as the sulphate, dissolved in water. Sprayed on foliage, this suspension of nicotine—containing clay eventually dries to a fine dust that kills the larvae of the codling moth feeding there. Nicotine-bentonite combinations, Mr. Strong says, would seem to be particularly useful in spraying early apples, which do not call for a very large number of applications of an insecticide and do not stand washing for spray residue removal as well as the firmer winter varieties.

Combinations of nicotine with peat also are being tested. Mixing free nicotine with peat in water produces a chemical reaction, consisting of the combination of the acid constituents of the peat with the nicotine, which is alkaline, to form two products—nicotine peat, which is insoluble in water, and nicotine humate, which is soluble in water. Nicotine peat contains up to 13 percent of nicotine in a form that will not wash off sprayed apples and foliage. What this material will do under practical orchard conditions remains to be seen.

Results with mixtures of nicotine sulphate in oil emulsions have been highly encouraging in the apple-growing regions of the Pacific Northwest and fairly encouraging in the Middle West and East. In the regular spray schedule, however, these mixtures are open to objection on several points. Sulphur fungicides—necessary to combat fungous diseases in many northeastern orchards—can not be used with them; too many applications may injure foliage; lead arsenate residues can not be as readily removed if nicotine and oil have been used in part of the season; and last, but perhaps not least, nicotine treatments are expensive.

Mailed Saturday, April 3rd, 1937.

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